calculatoratoz.com

unitsconverters.com

Multi Stage Amplifiers Formulas

Calculators! Examples! Conversions!

Bookmark **calculatoratoz.com**, **unitsconverters.com**

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

Please leave your feedback here...

List of 20 Multi Stage Amplifiers Formulas

Multi Stage Amplifiers

1) 3-DB Frequency in Design Insight and Trade-Off

Open Calculator

fx $$f_{3dB} = \frac{1}{2 \cdot \pi \cdot (C_t + C_{gd}) \cdot \left(\frac{1}{\frac{1}{R_L} + \frac{1}{R_{out}}} \right)}$$

ex $$50.15489\text{Hz} = \frac{1}{2 \cdot \pi \cdot (2.889\mu\text{F} + 1.345\mu\text{F}) \cdot \left(\frac{1}{\frac{1}{1.49\text{k}\Omega} + \frac{1}{1.508\text{k}\Omega}} \right)}$$

2) Amplifier Gain given Function of Complex Frequency Variable

Open Calculator

fx $$A_m = A_{mid} \cdot K$$

ex $$12.224\text{dB} = 32 \cdot 0.382$$

3) Break Frequency of Source Follower

Open Calculator

fx $$f_b = \frac{1}{\sqrt{c}}$$

ex $$104.0313\text{Hz} = \frac{1}{\sqrt{0.0000924}}$$

4) Constant 2 of Source Follower Transfer Function

Open Calculator

fx $$b = \left(\frac{(C_{gs} + C_{gd}) \cdot C_t + (C_{gs} + C_{gs})}{g_m \cdot R_L + 1} \right) \cdot R_{sig} \cdot R_L$$

ex $$1.188055 = \left(\frac{(2.6\mu F + 1.345\mu F) \cdot 2.889\mu F + (2.6\mu F + 2.6\mu F)}{4.8mS \cdot 1.49k\Omega + 1} \right) \cdot 1.25k\Omega \cdot 1.49k\Omega$$

5) Dominant Pole Frequency of Differential Amplifier

Open Calculator

fx $$f_p = \frac{1}{2 \cdot \pi \cdot C_t \cdot R_{out}}$$

ex $$36.53181Hz = \frac{1}{2 \cdot \pi \cdot 2.889\mu F \cdot 1.508k\Omega}$$

6) Dominant Pole-Frequency of Source-Follower

Open Calculator

fx $$f_{dp} = \frac{1}{2 \cdot \pi \cdot b}$$

ex $$0.134877Hz = \frac{1}{2 \cdot \pi \cdot 1.180}$$

7) Drain Resistance in Cascode Amplifier

Open Calculator

fx $$R_d = \frac{1}{\frac{1}{R_{in}} + \frac{1}{R_t}}$$

ex $$0.297143k\Omega = \frac{1}{\frac{1}{0.78k\Omega} + \frac{1}{0.480k\Omega}}$$

8) Frequency of Differential Amplifier given Load Resistance

Open Calculator

$$f_t = \frac{1}{2 \cdot \pi \cdot R_L \cdot C_t}$$

$$36.97314\text{Hz} = \frac{1}{2 \cdot \pi \cdot 1.49\text{k}\Omega \cdot 2.889\mu\text{F}}$$

9) Gain Bandwidth Product

Open Calculator

$$GB = \frac{g_m \cdot R_L}{2 \cdot \pi \cdot R_L \cdot (C_t + C_{gd})}$$

$$180.4307\text{Hz} = \frac{4.8\text{mS} \cdot 1.49\text{k}\Omega}{2 \cdot \pi \cdot 1.49\text{k}\Omega \cdot (2.889\mu\text{F} + 1.345\mu\text{F})}$$

10) Gain Factor

Open Calculator

$$K = \frac{A_m}{A_{mid}}$$

$$0.38125 = \frac{12.2\text{dB}}{32}$$

11) Gate to Source Capacitance of Source Follower

Open Calculator

$$C_{gs} = \frac{g_m}{f_{tr}}$$

$$2.600217\mu\text{F} = \frac{4.8\text{mS}}{1846\text{Hz}}$$

12) Input Resistance of CC CB Amplifier

Open Calculator

$$R_t = (\beta + 1) \cdot (R_e + R'_2)$$

$$0.480691\text{k}\Omega = (0.005 + 1) \cdot (0.468\text{k}\Omega + 0.0103\text{k}\Omega)$$

13) Overall Voltage Gain of CC CB Amplifier

Open Calculator

fx $$A_v = \frac{1}{2} \cdot \left(\frac{R_t}{R_t + R_{sig}} \right) \cdot R_L \cdot g_m$$

ex $$0.992185 = \frac{1}{2} \cdot \left(\frac{0.480\text{k}\Omega}{0.480\text{k}\Omega + 1.25\text{k}\Omega} \right) \cdot 1.49\text{k}\Omega \cdot 4.8\text{mS}$$

14) Power Gain of Amplifier given Voltage Gain and Current Gain

Open Calculator

fx $$A_p = A_v \cdot A_i$$

ex $$3.6926 = 0.998 \cdot 3.70$$

15) Short Circuit Transconductance of Differential Amplifier

Open Calculator

fx $$g_{ms} = \frac{i_{out}}{V_{id}}$$

ex $$2.03252\text{mS} = \frac{5\text{mA}}{2.46\text{V}}$$

16) Signal Voltage in High Frequency Response of Source and Emitter Follower

Open Calculator

fx $$V_{out} = (i_t \cdot R_{sig}) + V_{gs} + V_{th}$$

ex $$28.78025\text{V} = (19.105\text{mA} \cdot 1.25\text{k}\Omega) + 4\text{V} + 0.899\text{V}$$

17) Total Capacitance of CB-CG Amplifier

Open Calculator

fx $$C_t = \frac{1}{2 \cdot \pi \cdot R_L \cdot f_{out}}$$

ex $$12.08319\mu\text{F} = \frac{1}{2 \cdot \pi \cdot 1.49\text{k}\Omega \cdot 8.84\text{Hz}}$$

18) Transconductance of CC-CB Amplifier

Open Calculator

fx $$g_m = \frac{2 \cdot A_v}{\left(\frac{R_t}{R_t+R_{sig}}\right) \cdot R_L}$$

ex $$4.828132\text{mS} = \frac{2 \cdot 0.998}{\left(\frac{0.480\text{k}\Omega}{0.480\text{k}\Omega+1.25\text{k}\Omega}\right) \cdot 1.49\text{k}\Omega}$$

19) Transconductance of Source-Follower

Open Calculator

fx $$g_m = f_{tr} \cdot C_{gs}$$

ex $$4.7996\text{mS} = 1846\text{Hz} \cdot 2.6\mu\text{F}$$

20) Transition Frequency of Source-Follower Transfer Function

Open Calculator

fx $$f_{tr} = \frac{g_m}{C_{gs}}$$

ex $$1846.154\text{Hz} = \frac{4.8\text{mS}}{2.6\mu\text{F}}$$

Variables Used

- A_i Current Gain
- A_m Amplifier Gain in Mid Band *(Decibel)*
- A_{mid} Mid Band Gain
- A_p Power Gain
- A_v Voltage Gain
- **b** Constant B
- **c** Constant C
- C_{gd} Gate to Drain Capacitance *(Microfarad)*
- C_{gs} Gate to Source Capacitance *(Microfarad)*
- C_t Capacitance *(Microfarad)*
- f_{3dB} 3 dB Frequency *(Hertz)*
- f_b Break Frequency *(Hertz)*
- f_{dp} Frequency of Dominant Pole *(Hertz)*
- f_{out} Output Pole Frequency *(Hertz)*
- f_p Pole Frequency *(Hertz)*
- f_t Frequency *(Hertz)*
- f_{tr} Transition Frequency *(Hertz)*
- g_m Transconductance *(Millisiemens)*
- g_{ms} Short Circuit Transconductance *(Millisiemens)*
- **GB** Gain Bandwidth Product *(Hertz)*
- i_{out} Output Current *(Milliampere)*
- i_t Electric Current *(Milliampere)*
- **K** Gain Factor
- R'_2 Resistance of Secondary Winding in Primary *(Kilohm)*

- R_d Drain Resistance *(Kilohm)*
- R_e Emitter Resistance *(Kilohm)*
- R_{in} Finite Input Resistance *(Kilohm)*
- R_L Load Resistance *(Kilohm)*
- R_{out} Output Resistance *(Kilohm)*
- R_{sig} Signal Resistance *(Kilohm)*
- R_t Resistance *(Kilohm)*
- V_{gs} Gate to Source Voltage *(Volt)*
- V_{id} Differential Input Signal *(Volt)*
- V_{out} Output Voltage *(Volt)*
- V_{th} Threshold Voltage *(Volt)*
- β Common Emitter Current Gain

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Electric Current** in Milliampere (mA)
  Electric Current Unit Conversion
- Measurement: **Frequency** in Hertz (Hz)
  Frequency Unit Conversion
- Measurement: **Capacitance** in Microfarad (µF)
  Capacitance Unit Conversion
- Measurement: **Electric Resistance** in Kilohm (kΩ)
  Electric Resistance Unit Conversion
- Measurement: **Electric Conductance** in Millisiemens (mS)
  Electric Conductance Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion
- Measurement: **Sound** in Decibel (dB)
  Sound Unit Conversion

Check other formula lists

- **Common Stage Amplifiers Formulas**
- **Multi Stage Amplifiers Formulas**

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

2/13/2024 | 4:52:53 AM UTC *Please leave your feedback here...*